



# An Introduction to Wireless LAN

## Technology Background

Wireless Local Area Networks (also called wireless LANs) offer high-speed connectivity with freedom — freedom from cables, dial-up connections, and your desktop. Wireless LANs (WLANs) use radio frequency signals — sent by using transceivers — to broadcast and receive Web, e-mail, and other data using of the IEEE (Institute of Electrical & Electronics Engineers) standards: IEEE 802.11a, IEEE 802.11b, or IEEE 802.11g.<sup>1</sup>

WLAN radios are housed inside WLAN network adapters. There are various types of WLAN adapters which enable a PC or notebook to communicate on a wireless LAN. Some types of network adapters include wireless PCI network adapters (which are built into a desktop PC); wireless PC card network adapters (used with a notebook PC), and wireless USB network adapters (external adapters for desktop or notebook PCs).



Wireless-enabled PCs can communicate directly with each other through a wireless link; this is known as “ad hoc” mode. However, in order for a wireless PC to participate within a wireless LAN, a wireless-enabled PC must be within range (typically a few hundred feet) of one or more Access Points (APs). The AP serves as a wireless hub and has the ability to connect directly to a wired network. The AP allows wireless-enabled PCs to connect to the Internet, to a wired network or to other wireless-enabled PCs through the wireless LAN. Wireless networks offer the same functionality as wired networks: users can share files and photos with friends and family, surf the Web, send and receive e-mail, and more. In addition, they also have the freedom to move about their network area — around their home or office. WLAN users with laptops can also access the Internet from hot spots, public locations where a WLAN has been set up by a Hot Spot Operator (HSO) in conjunction with a Wireless Internet Service Provider (WISP) for public use.<sup>2</sup>

Other WLAN users can connect to any WLAN if they are within range of the network. Wireless LAN users should secure their wireless network using the options in their adapter and access point. For example, create a unique Service Set Identifier (SSID) on the network, turn on Wired Equivalent Privacy (WEP), and install the latest security standard 802.1x for advanced security features. VPN client software is also recommended for additional network protection.

Wireless LAN technology is constantly evolving. The number of Hot Spot Operators (HSOs) is growing daily, increasing the availability of wireless Internet in many areas around the country. In the future, users might even be able to roam with their PC as freely as they do with their cellular phones and have high-speed access to the Internet, to their office, and to their families with WLAN technologies developed by companies like Intel.



# Glossary

## A

**Access Point (AP)** — A wireless access point is a hub that connects many wireless clients to a LAN or to the Internet. An AP can be a standalone hardware device or a computer with a wireless network adapter and appropriate software. Wireless access points are available for IEEE 802.11a, 802.11b, and Dual band 802.11 a/b (access points with both 802.11a and 802.11b capability).

**Ad Hoc** — An ad hoc network is a network where the computers only share resources amongst each other (peer-to-peer network) and are not always connected to a wired network. In an ad hoc wireless network, the wireless-enabled computers can exchange data without an Access Point (see also *Infrastructure Mode*). An ad hoc network of wireless-enabled PCs allows users to quickly share files when they are within range of the other computers.

## B

### Bluetooth™ Wireless

**Technology** — Bluetooth™ is a short-range, low-power wireless networking protocol that can work at distances up to about 10 meters. This cable-replacement technology allows users to interconnect various communication devices, such as laptops, PDAs, cell phones, printers, camcorders, mice, headsets and keyboards, to one another. Bluetooth is one of the main technologies used to support Personal Area Networks (PANs) and is a complementary technology to 802.11.

**Broadband** — Broadband is the term applied to high-speed data transmission, such as cable, ISDN (Integrated Services Digital Network), and DSL (Digital Subscriber Line). Broadband technologies provide faster connections to the Internet than traditional dial-up services. Broadband services deliver high-speed Internet access to households and businesses while freeing telephone lines for simultaneous traditional (voice) use. Using a

broadband service with laptop or desktop PCs, users have high-speed access to the Internet, e-mail and more.

## D

**DSL (Digital Subscriber Line)** — DSL is a broadband technology that enables high-speed Internet access to a home or business over a standard telephone line. DSL is an always-on connection to the Internet that allows for simultaneous PC and telephone use.

## F

**Firewall** — A firewall is a network device that protects a network from unauthorized access, Denial of Service (DOS) attacks, ping-flooding, and other spurious activities that degrade the services of a network or impact the data stored on the network. A firewall can be a standalone device, part of another device, such as a wireless gateway or wireless router, or software running on a computer, such as a server. Firewalls are an important part of network security, protecting a private network (such as a home, small business, or enterprise network) from unauthorized access and attacks by hackers.

## G

**GPS (Global Positioning System)** — GPS is the satellite-based positioning technology that allows a GPS receiver to identify its location anywhere on Earth. GPS receivers can be found as handheld devices, installed in automobiles for navigational aids, and as modules that attach to Personal Data Assistants (PDAs), such as a PalmPilot\*.

### GPRS (General Packet Radio Service)

— GPRS is a standard for wireless communications that allows packets of data, such as e-mail and Web content, to travel across a wireless telephone network and to the Internet. GPRS is often referred to as “2.5G” technology (in comparison to first-generation (1G) wireless technology which is used for analog cell phones, and second-generation (2G) wireless technology which is used for digital cell phones). In addition to the GPRS

cell phone, laptops can be enabled by adding a GPRS adapter to connect to the Internet.

### GSM (Global System for Mobile Communications)

— GSM is a world standard for digital cellular communications using narrowband Time Division Multiple Access (TDMA) for voice and Short Messaging Service (SMS). With 65% of the world's cellular subscriptions on GSM technology, this currently represents the most commonly used cellular technology worldwide. (Source: Gartner Dataquest – Top 20 Mobile Network Operators Worldwide, 2001)

## H

**High-speed Cable Internet** — High-speed cable Internet is a broadband technology from cable service operators (also known as multi-service operators MSOs) that enables high-speed Internet access to the home over the standard television cable connection. Users can experience data transmission rates from a few hundred kbps to up to 30 Mbps over high-speed cable Internet. However, bandwidth significantly varies on a cable network since it is a shared medium. High-speed cable Internet is an open network, offering little security to users who connect directly to the cable connection without a cable/DSL firewall/router device.

**Hot Spot** — A hot spot is an area in a public or private location, such as a home, office, café, hotel, or airport, where users can gain high-speed Internet access over a wireless LAN. By using a wireless device, such as a 802.11-enabled laptop or PDA, users can access e-mail and the Internet at hot spot locations.<sup>3</sup>

**Hub** — A hub is a network device that connects multiple computers on a LAN so they can communicate with one another, the rest of the network, and the Internet. All users connected to a hub share the available network bandwidth (unlike a switch, which provides full bandwidth to each computer).

## I

**IEEE 802.11** — IEEE 802.11 refers to a family of specifications developed by the IEEE (Institute of Electrical and Electronics Engineers) for wireless LAN technology. 802.11 specifies how wireless network devices will communicate with one another. IEEE 802.11 established wireless networking standards including 802.11a, 802.11b, and 802.11g.

**IEEE 802.11a** — IEEE 802.11a describes the wireless networking standard for WLANs that operate in the 5 GHz radio band (ISM frequency band). 802.11a-based WLANs can achieve a maximum speed of 54 Mbps per second, providing nearly five-times faster networking data rate than 802.11b and can handle more traffic than 802.11b-based networks.

**IEEE 802.11b** — IEEE 802.11b (commonly known as “Wi-Fi”) describes the wireless networking standard for WLANs that operate in the 2.4 GHz radio band (ISM frequency band). 802.11b-based WLANs are far more common than 802.11a or 802.11g networks and can achieve a maximum data rate of 11 Mbps per second at distances up to approximately 300 feet. 802.11b was the first WLAN technology offered to consumers and enabled the creation of instant wireless networks in offices and homes. Devices certified by Wi-Fi Alliance bear the official Wi-Fi logo.

**IEEE 802.11g** — IEEE 802.11g is a new standard, describing a wireless networking method for WLANs that operates in the 2.4 GHz radio band (ISM frequency band). By using OFDM (Orthogonal Frequency Division Multiplexing) technology 802.11g-based WLANs can achieve a maximum speed of 54 Mbps. IEEE 802.11g-compliant equipment, such as wireless access points, can provide simultaneous WLAN connectivity for both 802.11g and 802.11b equipment.<sup>1</sup>

**Infrastructure Mode** — A wireless network can be set up as an ad hoc network or as infrastructure. In infrastructure mode, the wireless network uses an Access Point (AP) to connect wireless-enabled PCs to the wired LAN and to each other. The AP is a hub for all wireless network adapters it communicates with (see also *Access Point*).

## L

**LAN (Local Area Network)** — A LAN is the connection of several digital devices through wired and wireless technologies, linked by public access routers to the WAN or the MAN. LANs cover short and medium distances (from 100 meters to 5 kilometers) and are installed in homes, small offices, and large corporate campuses. LANs are considered private networks, because, in order to access the network, your computer must be able to connect to it. The PAN is a special case of a LAN.

## M

**MAN (Metropolitan Area Network)** — The MAN is a high-speed network used within a town or city. A MAN typically provides very high-speed connections, using fiber-optic cable or other digital media, between LANs in the same area. An example is AbMAN, the Aberdeen Metropolitan Area Network ([www.abman.ent.uk](http://www.abman.ent.uk)). More recently, in a growing number of communities, 802.11b-based WLANs have interconnected to form wireless MANs using inexpensive antenna systems and consumer-level 802.11b and 802.11a wireless equipment. An example is Personal Telco ([www.personaltelco.net](http://www.personaltelco.net)).

## P

**PAN (Personal Area Network)** — The PAN is a wireless LAN with a very short range (up to 10 meters). PANs are used to connect devices, such as PDA, keyboard, mouse, printer, etc. that a single person uses with their computer. PANs enable easier interconnection between devices by eliminating cables. Bluetooth is a technology commonly used to form a PAN.

## R

**RF (Radio Frequency)** — RF covers a range of high-frequency, electromagnetic frequencies used for radio transmissions. In communications, RF signals transmit data using various methods, such as TDMA, CDMA, DSSS, and others. WLANs, PANs, Bluetooth, and other wireless technologies use RF signals to transmit data.

**Roaming** — Roaming is the ability of a radio device to move outside its normal area of operation to another area and gain access to the home network. In a wireless network, roaming refers to moving from one Wireless Access Point area to another without losing service or a loss in connectivity. Roaming lets users move about freely and continue to access the Internet and e-mail.

## S

**SSID (Service Set Identifier)** — An SSID is the name that uniquely identifies a wireless network. Wireless access points broadcast the SSID so that end-users can identify the WLAN they want to connect to. Different SSIDs enable different WLANs to exist in the same physical space, and SSIDs must be identical between the wireless access point and the wireless network adapter to allow access to the wireless network. To enhance security in a WLAN, an administrator can turn off the broadcast function of some wireless access points to prevent broadcasting across the SSID. For a client to connect to the network, the end-user would have to manually enter the SSID.

**Switch** — A switch is a network device that connects multiple computers on a LAN so they can communicate with one another, the rest of the network, and the Internet. Unlike a hub, users connected to a switch do not share the available bandwidth; each switch port runs at the full bandwidth of the switch port. Switches allow multiple PCs to be connected to the same network without losing bandwidth speed.

## V

### **VPN (Virtual Private Network) —**

A VPN is a secure Internet connection using encryption and tunneling protocols to create a safe connection, or tunnel, to a private network. VPNs provide highly secure connections between remote clients, such as branch offices or traveling personnel, and a central office. A variety of VPN routers is available for both home and office use.

## W

**WAN (Wide-Area Network) —** A WAN connects LANs and MANs over great distances, such as across the country and around the world. The WAN is built on the services of “long-haul” communications carriers, such as Sprint\* and UUNET\*, who use fiber-optic cable, satellite, and other high-speed communications technologies.

**WEP (Wired Equivalent Privacy Encryption) —** WEP is a standard used to encrypt wireless transmissions to protect data in transit. WEP provides users with secure connections in a WLAN environment. WEP offers different levels of encryption, from 40-bit to a higher security rating of 128-bit encryption. WEP must be enabled in the Wireless Access Point and client network adapter to ensure encrypted transmissions.

**Wi-Fi\* (Wireless Fidelity) —** Wi-Fi\* is a name applied to equipment that complies with the IEEE 802.11b wireless standard, as defined by Wi-Fi Alliance. Wi-Fi logos help identify wireless networking components that are certified to work in 802.11b WLANs.

### **WISP (Wireless Internet Service**

**Provider) —** A Wireless Internet Service Provider provides Internet services to homes and business using wireless networking technology, including 802.11a/b. WISP customers communicate with their WISP using an antenna. In some cases, the antenna on the wireless network adapter is all a user needs to communicate with their WISP. In many cases, however, users must install an external antenna. Hot spots operators (HSOs) are WISPs, providing Internet services to customers in small areas, such as a hotel, airport, or coffee shop (see also Hot Spot). WISPs make Internet accessible to users in outlying areas, where DSL and cable Internet are not available.

**Wireless Gateway —** A wireless gateway is a wireless access point that provides a central connection between a wireless network and other networks, including the Internet. Wireless gateways can provide important services, such as network address translation (NAT) and firewalling. A wireless gateway is an essential part of a home or small business wireless network when connecting to the Internet through broadband technologies such as DSL or cable.

**Wireless PC Card —** A wireless PC card is an 802.11 WLAN adapter that fits into a PCMCIA slot in a laptop or desktop computer. Wireless PC cards enable a user to connect to a wireless network. A wireless PC card and a PC can also be used to share an Internet connection with a WLAN.

**Wireless Print Server —** A wireless print server connects users on a wireless network to a printer without the need for cables. Print data is

transmitted across the WLAN to the wireless print server where it is queued for printing. Wireless print servers enable quick and easy installation of printers anywhere within a WLAN area.

**Wireless Router —** A wireless router is a network device that routes IP traffic across several wireless IP networks and wired networks. Wireless routers are used to build independent WLANs that can communicate with each other and the Internet. Some Access Points can function either as a wireless gateway or wireless router, while other devices function solely as a wireless router.

### **Wireless USB Network Adapter —**

A wireless USB network adapter is a wireless network adapter that connects a computer to a wireless network using the computer's USB port instead of plugging into the CardBus or the PCI bus. (See also Wireless PC Card.) A wireless USB network adapter provides the same functionality as a wireless PC card or an internal wireless network adapter, but is quicker to install and can be moved from one computer to another.

### **WLAN (Wireless Local Area**

**Network) —** A WLAN is a wireless implementation of a LAN, but users can move around. WLANs provide the same functionality (connectivity) as a LAN, but usually at 11 Mbps for 802.11b; 54 Mbps for 802.11a. WLANs are commonly based on the IEEE 802.11 standard. WLANs enable users to quickly build a network of computers without installing cables and give them freedom to move from place to place without losing connectivity.

<sup>1</sup> Not yet ratified by IEEE.

<sup>2</sup> User fees might apply.

<sup>3</sup> Additional hardware or software may need to be purchased and installed separately. Fees may apply.

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